

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

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(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PE17988PC00	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE2003/001922	International filing date (day/month/year) 09-12-2003	Priority date (day/month/year)
International Patent Classification (IPC) or national classification and IPC See Supplemental Box		
Applicant Telefonaktiebolaget LM Ericsson (publ) et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:

- ☒ (sent to the applicant and to the International Bureau) a total of 6 sheets, as follows:
 - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

- ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

Date of submission of the demand 01-09-2005	Date of completion of this report 08-03-2006
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Form PCT/IPEA/409 (cover sheet) (April 2005)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003/001922

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Cover sheet

International patent classification (IPC)

H04Q 7/38 (2006.01)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003/001922

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

the international application in the language in which it was filed

a translation of the international application into _____,
which is the language of a translation furnished for the purposes of:

international search (Rules 12.3(a) and 23.1(b))



publication of the international application (Rule 12.4(a))



international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

the international application as originally filed/furnished



the description:

pages 1 - 25 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____



the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* 1 - 6 received by this Authority on 05-01-2006

pages* _____ received by this Authority on _____



the drawings:

pages 1 - 8 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____



a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

the description, pages _____



the claims, Nos. _____



the drawings, sheets/figs _____

the sequence listing (*specify*): _____any table(s) related to the sequence listing (*specify*): _____4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages _____



the claims, Nos. _____



the drawings, sheets/figs _____

the sequence listing (*specify*): _____any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003/001922

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-21</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-21</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-21</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The invention concerns an arrangement, and a method for sharing communication resources among two or more operators, and solves the problem of providing a high utilisation of resources, while providing a fair allocation of resources between different operators.

Document cited in the International Search Report:

D1: EP 1220557 A1

The cited document represents the general state of the art.

The invention defined in claims 1-21 is not disclosed by this document.

The cited prior art does not give any indication that would lead a person skilled in the art to the claimed method of or arrangement for managing resources in a communication system by way of evaluating two threshold values as is suggested in the independent claims 1 and 19.

Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-19 is novel and is considered to involve an inventive step. The invention is industrially applicable.

0 5 -01- 2006

AMENDED CLAIMS

1. Method for managing resources in a communication system (10) having resources shared by at least two operators (12, 14), comprising the steps of:

receiving an access request for a first operator of the at least two operators (12, 14); and

executing a first determination whether there are sufficient amount of free resources available in the communication system (10),

characterised by the further steps of:

executing a second determination whether a total amount of said resources shared by at least two operators in use in the communication system (10) exceeds a first threshold;

executing a third determination whether a total amount of said resources shared by at least two operators in use for the first operator exceeds a second threshold; and

deciding on accepting the access request based on the results of the first, second and third determinations.

2. Method according to claim 1, **characterised in that** the step of executing the second determination is performed only if the first determination shows that there are sufficient free resources available in the communication system (10).

3. Method according to claim 1 or 2, **characterised in that** the access request is accepted if the second determination shows that the total amount of resources in use in the communication system (10) does not exceed the first threshold.

4. Method according to claim 1 or 2, **characterised by** size discrimination based on the capacity requested by the incoming connection dependent on the total amount of resources in use in the communication system (10) if the second determination shows that the total amount of

resources in use in the communication system (10) does not exceed the first threshold.

5. Method according to claim 4, **characterised in that** the size discrimination comprises the steps of:

determination of a threshold class dependent on the total amount of resources in use in the communication system (10);

comparing an amount of resources required by the access request with a maximum accepted size (ξ_1 , ξ_2 , ξ_3) associated with the determined threshold class;

accepting the access request if the amount of resources ($r_a - r_d$) required by the access request is smaller than or equal to the maximum accepted size (ξ_1 , ξ_2 , ξ_3); and

rejecting the access request if the amount of resources ($r_a - r_d$) required by the access request is larger than the maximum accepted size (ξ_1 , ξ_2 , ξ_3).

6. Method according to any of the claims 2 to 5, **characterised in that** the step of executing the third determination is performed only if the second determination shows that the total amount of resources in use in the communication system exceeds the first threshold.

7. Method according to claim 6, **characterised in that** the access request is accepted if the third determination shows that the total amount of resources in use for the first operator does not exceed the second threshold.

8. Method according to any of the claims 1 to 7, **characterised in that** the first threshold is equal to a pre-determined congestion threshold (β).

9. Method according to any of the claims 1 to 7, **characterised in that** the first threshold is equal to a pre-determined congestion threshold (β) minus the amount of resources (r/C) required by the access request.

10. Method according to any of the claims 1 to 9, **characterised in that** the second threshold is equal to a pre-determined portion of the total resources allocated to the first operator (p_1 , p_2 , p_3).

5 11. Method according to any of the claims 1 to 9, **characterised in that** the second threshold is equal to a pre-determined portion of the total resources allocated to the first operator (p_1 , p_2 , p_3) minus the amount of resources (r/C) required by the access request.

10 12. Method according to any of the claims 1 to 11, **characterised by** storing a respective measure (u_i) of the fraction of resources currently in use by each of said at least two operators (12, 14), said measure (u_i) for the first operator being updated upon accepting the access request or when an already established connection for the first operator is terminated.

15 13. Method according to claim 12, **characterised by** updating the respective measures (u_i) by means of resource utilisation information from an external source.

20 14. Method according to any of the claims 1 to 13, **characterised in that** the access request is rejected if the first determination shows that there are not sufficient free resources available in the communication system (10) or if the third determination shows that the total amount of resources in use for the first operator exceeds the second threshold.

25 15. Method according to any of the claims 1 to 13, **characterised in that** a step of evaluating a priority of the access request if the first determination shows that there are not sufficient free resources available in the communication system (10) or if the third determination shows that the total
30 amount of resources in use for the first operator exceeds the second threshold.

16. Method according to claim 15, **characterised in that** the step of evaluating the priority comprises the steps of:

5 executing a fourth determination whether the sum of the free resources available in the communication system (10) and a total amount of resources being occupied by traffic having a lower priority than the priority of the access request for the first operator is smaller than the amount of resources required for the access request for the first operator;

10 rejecting the access request if the fourth determination shows that the sum of the free resources available in the communication system (10) and the total amount of resources being occupied by traffic having a lower priority than the priority of the access request for the first operator is smaller than the amount of resources required for the access request for the first operator; and

15 pre-empting on-going traffic sufficient to allow the access request for the first operator if the fourth determination shows that the sum of the free resources available in the communication system (10) and the total amount of resources being occupied by traffic having a lower priority than the priority of the access request for the first operator is equal to or larger than the amount of resources required for the access request for the first operator, and accepting the access request.

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17. Method according to claim 16, **characterised in that** the step of pre-empting in turn comprises the steps of:

25 determining which operator of the at least two operators (12, 14) presently being in most excess of its target resource utilisation;

 selecting a connection of the operator of the at least two operators (12, 14) presently being in most excess of its target resource utilisation having a lower priority than the priority of the access request for the first operator;

 releasing the selected connection;

30 determining whether the resources required for the access request is larger than the free resources available in the communication system (10); and

repeating the previous steps if the resources required for the access request is larger than the free resources available in the communication system (10).

5 18. Method according to any of the claims 1 to 17, **characterised in that** the step of receiving an access request for the first operator in turn comprises the steps of:

receiving a renegotiation request for an ongoing call from the first operator;

10 providing a supplementary access request for the first operator having an access request size corresponding to the difference between a requested size and a present size of the ongoing call, if the requested size is larger than the present size; and

15 performing a change of resource utilisation for the ongoing call, if the present size is larger than the requested size.

19. Arrangement being or comprising a device for managing resources in a communication system (10), the communication system (10) having resources shared by at least two operators (12, 14), the device comprising:

20 means for receiving an access request for a first operator of the at least two operators (12, 14); and

means for executing a first determination whether there are sufficient amount of free resources available in the communication system (10),

characterised by:

25 means for executing a second determination whether a total amount of said resources shared by at least two operators in use in the communication system (10) exceeds a first threshold;

means for executing a third determination whether a total amount of said resources shared by at least two operators in use for the first operator exceeds a second threshold; and

30 means for deciding on accepting the access request based on the results of the first, second and third determinations.

20. Arrangement according to claim 19, **characterised in that** the arrangement is a shared universal mobile telecommunication system terrestrial radio access network and the device is comprised in a radio network controller.

21. Arrangement according to claim 19, **characterised in that** the arrangement is the communication system (10).
